



SEQUENCE LISTING

<110> Carulli, John P.
Little, Randall D.
Recker, Robert R.
Johnson, Mark L.

<120> High bone mass gene of 11q13.3

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<140> US 09/543,771

<141> 2000-04-05

<150> US 09/229,319

<151> 1999-01-13

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| | | | | | | | | | | | | | | | | |
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| 1741 | Glu | Asp | Lys | Leu | Pro | His | Ile | Phe | Gly | Phe | Thr | Leu | Leu | Gly | Asp | Phe |
| | | | | 545 | | | | | 550 | | | | | 555 | | |
| | atc | tac | tgg | act | gac | tgg | cag | cgc | cgc | agc | atc | gag | cgg | gtg | cac | aag |
| 1789 | Ile | Tyr | Trp | Thr | Asp | Trp | Gln | Arg | Arg | Ser | Ile | Glu | Arg | Val | His | Lys |
| | | | 560 | | | | 565 | | | | | 570 | | | | |
| | gtc | aag | gcc | agc | cgg | gac | gtc | atc | att | gac | cag | ctg | ccc | gac | ctg | atg |
| 1837 | Val | Lys | Ala | Ser | Arg | Asp | Val | Ile | Ile | Asp | Gln | Leu | Pro | Asp | Leu | Met |
| | 575 | | | | | 580 | | | | | 585 | | | | | |
| | ggg | ctc | aaa | gct | gtg | aat | gtg | gcc | aag | gtc | gtc | gga | acc | aac | ccg | tgt |
| 1885 | Gly | Leu | Lys | Ala | Val | Asn | Val | Ala | Lys | Val | Val | Gly | Thr | Asn | Pro | Cys |
| 590 | | | | | | 595 | | | | | 600 | | | | 605 | |
| | gcg | gac | agg | aac | ggg | ggg | tgc | agc | cac | ctg | tgc | ttc | ttc | aca | ccc | cac |
| 1933 | Ala | Asp | Arg | Asn | Gly | Gly | Cys | Ser | His | Leu | Cys | Phe | Phe | Thr | Pro | His |
| | | | | 610 | | | | | 615 | | | | | 620 | | |
| | gca | acc | cgg | tgt | ggc | tgc | ccc | atc | ggc | ctg | gag | ctg | ctg | agt | gac | atg |
| 1981 | Ala | Thr | Arg | Cys | Gly | Cys | Pro | Ile | Gly | Leu | Glu | Leu | Leu | Ser | Asp | Met |
| | | | 625 | | | | | 630 | | | | | | 635 | | |
| | aag | acc | tgc | atc | gtg | cct | gag | gcc | ttc | ttg | gtc | ttc | acc | agc | aga | gcc |
| 2029 | Lys | Thr | Cys | Ile | Val | Pro | Glu | Ala | Phe | Leu | Val | Phe | Thr | Ser | Arg | Ala |
| | | 640 | | | | 645 | | | | | | 650 | | | | |
| | gcc | atc | cac | agg | atc | tcc | ctc | gag | acc | aat | aac | aac | gac | gtg | gcc | atc |
| 2077 | Ala | Ile | His | Arg | Ile | Ser | Leu | Glu | Thr | Asn | Asn | Asn | Asp | Val | Ala | Ile |
| | 655 | | | | | 660 | | | | | | 665 | | | | |
| | ccg | ctc | acg | ggc | gtc | aag | gag | gcc | tca | gcc | ctg | gac | ttt | gat | gtg | tcc |
| 2125 | Pro | Leu | Thr | Gly | Val | Lys | Glu | Ala | Ser | Ala | Leu | Asp | Phe | Asp | Val | Ser |
| 670 | | | | | | 675 | | | | 680 | | | | | 685 | |
| | aac | aac | cac | atc | tac | tgg | aca | gac | gtc | agc | ctg | aag | acc | atc | agc | cgc |
| 2173 | Asn | Asn | His | Ile | Tyr | Trp | Thr | Asp | Val | Ser | Leu | Lys | Thr | Ile | Ser | Arg |
| | | | 690 | | | | | 695 | | | | | | 700 | | |
| | gcc | ttc | atg | aac | ggg | agc | tcg | gtg | gag | cac | gtg | gtg | gag | ttt | ggc | ctt |
| 2221 | Ala | Phe | Met | Asn | Gly | Ser | Ser | Val | Glu | His | Val | Val | Glu | Phe | Gly | Leu |
| | | | 705 | | | | | 710 | | | | | 715 | | | |
| | gac | tac | ccc | gag | ggc | atg | gcc | gtt | gac | tgg | atg | ggc | aag | aac | ctc | tac |
| 2269 | Asp | Tyr | Pro | Glu | Gly | Met | Ala | Val | Asp | Trp | Met | Gly | Lys | Asn | Leu | Tyr |
| | | 720 | | | | | 725 | | | | | 730 | | | | |
| | tgg | gcc | gac | act | ggg | acc | aac | aga | atc | gaa | gtg | gcg | cgg | ctg | gac | ggg |
| 2317 | Trp | Ala | Asp | Thr | Gly | Thr | Asn | Arg | Ile | Glu | Val | Ala | Arg | Leu | Asp | Gly |
| | 735 | | | | | 740 | | | | | | 745 | | | | |
| | cag | ttc | cgg | caa | gtc | ctc | gtg | tgg | agg | gac | ttg | gac | aac | ccg | agg | tcg |
| 2365 | Gln | Phe | Arg | Gln | Val | Leu | Val | Trp | Arg | Asp | Leu | Asp | Asn | Pro | Arg | Ser |
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 Pro His Pro Phe Gly Leu Thr Gln Tyr Ser Asp Tyr Ile Tyr Trp Thr
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 Pro Asp Arg Gln Pro His Asp Leu Ser Ile Asp Ile Tyr Ser Arg Thr
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Ala His Pro Cys Ala Arg Asp Asn Gly Gly Cys Ser His Ile Cys Ile
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 Phe Pro His Glu Tyr Val Ser Gly Thr Pro His Val Pro Leu Asn Phe
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 Ile Ala Pro Gly Gly Ser Gln His Gly Pro Phe Thr Gly Ile Ala Cys

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Pro Ser Pro Ala Thr Asp Pro Ser Leu Tyr Asn Met Asp Met Phe Tyr
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109
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157
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Ala Ala Ser Pro Leu Leu Leu Phe Ala Asn Arg Arg Asp Val Arg Leu
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Tyr Trp Thr Asp Val Ser Glu Glu Ala Ile Lys Gln Thr Tyr Leu Asn
      80          85          90
cag acg ggg gcc gcc gtg cag aac gtg gtc atc tcc ggc ctg gtc tct
397
Gln Thr Gly Ala Ala Val Gln Asn Val Val Ile Ser Gly Leu Val Ser
      95          100          105
ccc gac ggc ctc gcc tgc gac tgg gtg ggc aag aag ctg tac tgg acg
445
Pro Asp Gly Leu Ala Cys Asp Trp Val Gly Lys Lys Leu Tyr Trp Thr
  110          115          120          125
gac tca gag acc aac cgc atc gag gtg gcc aac ctc aat ggc aca tcc
493
Asp Ser Glu Thr Asn Arg Ile Glu Val Ala Asn Leu Asn Gly Thr Ser
      130          135          140
cgg aag gtg ctc ttc tgg cag gac ctt gac cag ccg agg gcc atc gcc
541
Arg Lys Val Leu Phe Trp Gln Asp Leu Asp Gln Pro Arg Ala Ile Ala
      145          150          155
ttg gac ccc gct cac ggg tac atg tac tgg aca gac tgg gtt gag acg
589
Leu Asp Pro Ala His Gly Tyr Met Tyr Trp Thr Asp Trp Val Glu Thr
      160          165          170
ccc cgg att gag cgg gca ggg atg gat ggc agc acc cgg aag atc att
637
Pro Arg Ile Glu Arg Ala Gly Met Asp Gly Ser Thr Arg Lys Ile Ile
      175          180          185
gtg gac tcg gac att tac tgg ccc aat gga ctg acc atc gac ctg gag
685
Val Asp Ser Asp Ile Tyr Trp Pro Asn Gly Leu Thr Ile Asp Leu Glu
      190          195          200          205
gag cag aag ctc tac tgg gct gac gcc aag ctc agc ttc atc cac cgt
733

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Glu Gln Lys Leu Tyr Trp Ala Asp Ala Lys Leu Ser Phe Ile His Arg
 210 215 220
 gcc aac ctg gac ggc tcg ttc cgg cag aag gtg gtg gag ggc agc ctg
 781
 Ala Asn Leu Asp Gly Ser Phe Arg Gln Lys Val Val Glu Gly Ser Leu
 225 230 235
 acg cac ccc ttc gcc ctg acg ctc tcc ggg gac act ctg tac tgg aca
 829
 Thr His Pro Phe Ala Leu Thr Leu Ser Gly Asp Thr Leu Tyr Trp Thr
 240 245 250
 gac tgg cag acc cgc tcc atc cat gcc tgc aac aag cgc act ggg ggg
 877
 Asp Trp Gln Thr Arg Ser Ile His Ala Cys Asn Lys Arg Thr Gly Gly
 255 260 265
 aag agg aag gag atc ctg agt gcc ctc tac tca ccc atg gac atc cag
 925
 Lys Arg Lys Glu Ile Leu Ser Ala Leu Tyr Ser Pro Met Asp Ile Gln
 270 275 280 285
 gtg ctg agc cag gag cgg cag cct ttc ttc cac act cgc tgt gag gag
 973
 Val Leu Ser Gln Glu Arg Gln Pro Phe Phe His Thr Arg Cys Glu Glu
 290 295 300
 gac aat ggc ggc tgc tcc cac ctg tgc ctg ctg tcc cca agc gag cct
 1021
 Asp Asn Gly Gly Cys Ser His Leu Cys Leu Leu Ser Pro Ser Glu Pro
 305 310 315
 ttc tac aca tgc gcc tgc ccc acg ggt gtg cag ctg cag gac aac ggc
 1069
 Phe Tyr Thr Cys Ala Cys Pro Thr Gly Val Gln Leu Gln Asp Asn Gly
 320 325 330
 agg acg tgt aag gca gga gcc gag gag gtg ctg ctg ctg gcc cgg cgg
 1117
 Arg Thr Cys Lys Ala Gly Ala Glu Glu Val Leu Leu Leu Ala Arg Arg
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 acg gac cta cgg agg atc tcg ctg gac acg ccg gac ttc acc gac atc
 1165
 Thr Asp Leu Arg Arg Ile Ser Leu Asp Thr Pro Asp Phe Thr Asp Ile
 350 355 360 365
 gtg ctg cag gtg gac gac atc cgg cac gcc att gcc atc gac tac gac
 1213
 Val Leu Gln Val Asp Asp Ile Arg His Ala Ile Ala Ile Asp Tyr Asp
 370 375 380
 ccg cta gag ggc tat gtc tac tgg aca gat gac gag gtg cgg gcc atc
 1261
 Pro Leu Glu Gly Tyr Val Tyr Trp Thr Asp Asp Glu Val Arg Ala Ile
 385 390 395
 cgc agg gcg tac ctg gac ggg tct ggg gcg cag acg ctg gtc aac acc
 1309
 Arg Arg Ala Tyr Leu Asp Gly Ser Gly Ala Gln Thr Leu Val Asn Thr
 400 405 410
 gag atc aac gac ccc gat ggc atc gcg gtc gac tgg gtg gcc cga aac
 1357
 Glu Ile Asn Asp Pro Asp Gly Ile Ala Val Asp Trp Val Ala Arg Asn
 415 420 425
 ctc tac tgg acc gac acg ggc acg gac cgc atc gag gtg acg cgc ctc
 1405
 Leu Tyr Trp Thr Asp Thr Gly Thr Asp Arg Ile Glu Val Thr Arg Leu

| | | | | | | | | | | | | | | | | |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 430 | | | | | 435 | | | | 440 | | | | 445 | | | |
| aac | ggc | acc | tcc | cgc | aag | atc | ctg | gtg | tcg | gag | gac | ctg | gac | gag | ccc | |
| 1453 | Asn | Gly | Thr | Ser | Arg | Lys | Ile | Leu | Val | Ser | Glu | Asp | Leu | Asp | Glu | Pro |
| | | | | | 450 | | | | 455 | | | | 460 | | | |
| cga | gcc | atc | gca | ctg | cac | ccc | gtg | atg | ggc | ctc | atg | tac | tgg | aca | gac | |
| 1501 | Arg | Ala | Ile | Ala | Leu | His | Pro | Val | Met | Gly | Leu | Met | Tyr | Trp | Thr | Asp |
| | | | | | 465 | | | | 470 | | | | 475 | | | |
| tgg | gga | gag | aac | cct | aaa | atc | gag | tgt | gcc | aac | ttg | gat | ggg | cag | gag | |
| 1549 | Trp | Gly | Glu | Asn | Pro | Lys | Ile | Glu | Cys | Ala | Asn | Leu | Asp | Gly | Gln | Glu |
| | | | | | 480 | | | | 485 | | | | 490 | | | |
| cgg | cgt | gtg | ctg | gtc | aat | gcc | tcc | ctc | ggg | tgg | ccc | aac | ggc | ctg | gcc | |
| 1597 | Arg | Arg | Val | Leu | Val | Asn | Ala | Ser | Leu | Gly | Trp | Pro | Asn | Gly | Leu | Ala |
| | | | | | 495 | | | | 500 | | | | 505 | | | |
| ctg | gac | ctg | cag | gag | ggg | aag | ctc | tac | tgg | gga | gac | gcc | aag | aca | gac | |
| 1645 | Leu | Asp | Leu | Gln | Glu | Gly | Lys | Leu | Tyr | Trp | Gly | Asp | Ala | Lys | Thr | Asp |
| 510 | | | | | 515 | | | | 520 | | | | 525 | | | |
| aag | atc | gag | gtg | atc | aat | gtt | gat | ggg | acg | aag | agg | cgg | acc | ctc | ctg | |
| 1693 | Lys | Ile | Glu | Val | Ile | Asn | Val | Asp | Gly | Thr | Lys | Arg | Arg | Thr | Leu | Leu |
| | | | | | 530 | | | | 535 | | | | 540 | | | |
| gag | gac | aag | ctc | ccg | cac | att | ttc | ggg | ttc | acg | ctg | ctg | ggg | gac | ttc | |
| 1741 | Glu | Asp | Lys | Leu | Pro | His | Ile | Phe | Gly | Phe | Thr | Leu | Leu | Gly | Asp | Phe |
| | | | | | 545 | | | | 550 | | | | 555 | | | |
| atc | tac | tgg | act | gac | tgg | cag | cgc | cgc | agc | atc | gag | cgg | gtg | cac | aag | |
| 1789 | Ile | Tyr | Trp | Thr | Asp | Trp | Gln | Arg | Arg | Ser | Ile | Glu | Arg | Val | His | Lys |
| | | | | | 560 | | | | 565 | | | | 570 | | | |
| gtc | aag | gcc | agc | cgg | gac | gtc | atc | att | gac | cag | ctg | ccc | gac | ctg | atg | |
| 1837 | Val | Lys | Ala | Ser | Arg | Asp | Val | Ile | Ile | Asp | Gln | Leu | Pro | Asp | Leu | Met |
| | | | | | 575 | | | | 580 | | | | 585 | | | |
| ggg | ctc | aaa | gct | gtg | aat | gtg | gcc | aag | gtc | gtc | gga | acc | aac | ccg | tgt | |
| 1885 | Gly | Leu | Lys | Ala | Val | Asn | Val | Ala | Lys | Val | Val | Gly | Thr | Asn | Pro | Cys |
| 590 | | | | | 595 | | | | 600 | | | | 605 | | | |
| gcg | gac | agg | aac | ggg | ggg | tgc | agc | cac | ctg | tgc | ttc | ttc | aca | ccc | cac | |
| 1933 | Ala | Asp | Arg | Asn | Gly | Gly | Cys | Ser | His | Leu | Cys | Phe | Phe | Thr | Pro | His |
| | | | | | 610 | | | | 615 | | | | 620 | | | |
| gca | acc | cgg | tgt | ggc | tgc | ccc | atc | ggc | ctg | gag | ctg | ctg | agt | gac | atg | |
| 1981 | Ala | Thr | Arg | Cys | Gly | Cys | Pro | Ile | Gly | Leu | Glu | Leu | Leu | Ser | Asp | Met |
| | | | | | 625 | | | | 630 | | | | 635 | | | |
| aag | acc | tgc | atc | gtg | cct | gag | gcc | ttc | ttg | gtc | ttc | acc | agc | aga | gcc | |
| 2029 | Lys | Thr | Cys | Ile | Val | Pro | Glu | Ala | Phe | Leu | Val | Phe | Thr | Ser | Arg | Ala |
| | | | | | 640 | | | | 645 | | | | 650 | | | |
| gcc | atc | cac | agg | atc | tcc | ctc | gag | acc | aat | aac | aac | gac | gtg | gcc | atc | |
| 2077 | Ala | Ile | His | Arg | Ile | Ser | Leu | Glu | Thr | Asn | Asn | Asn | Asp | Val | Ala | Ile |
| | | | | | 655 | | | | 660 | | | | 665 | | | |

ccg ctc acg ggc gtc aag gag gcc tca gcc ctg gac ttt gat gtg tcc
 2125
 Pro Leu Thr Gly Val Lys Glu Ala Ser Ala Leu Asp Phe Asp Val Ser
 670 675 680 685
 aac aac cac atc tac tgg aca gac gtc agc ctg aag acc atc agc cgc
 2173
 Asn Asn His Ile Tyr Trp Thr Asp Val Ser Leu Lys Thr Ile Ser Arg
 690 695 700
 gcc ttc atg aac ggg agc tcg gtg gag cac gtg gtg gag ttt ggc ctt
 2221
 Ala Phe Met Asn Gly Ser Ser Val Glu His Val Val Glu Phe Gly Leu
 705 710 715
 gac tac ccc gag ggc atg gcc gtt gac tgg atg ggc aag aac ctc tac
 2269
 Asp Tyr Pro Glu Gly Met Ala Val Asp Trp Met Gly Lys Asn Leu Tyr
 720 725 730
 tgg gcc gac act ggg acc aac aga atc gaa gtg gcg cgg ctg gac ggg
 2317
 Trp Ala Asp Thr Gly Thr Asn Arg Ile Glu Val Ala Arg Leu Asp Gly
 735 740 745
 cag ttc cgg caa gtc ctc gtg tgg agg gac ttg gac aac ccg agg tcg
 2365
 Gln Phe Arg Gln Val Leu Val Trp Arg Asp Leu Asp Asn Pro Arg Ser
 750 755 760 765
 ctg gcc ctg gat ccc acc aag ggc tac atc tac tgg acc gag tgg ggc
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 Leu Ala Leu Asp Pro Thr Lys Gly Tyr Ile Tyr Trp Thr Glu Trp Gly
 770 775 780
 ggc aag ccg agg atc gtg cgg gcc ttc atg gac ggg acc aac tgc atg
 2461
 Gly Lys Pro Arg Ile Val Arg Ala Phe Met Asp Gly Thr Asn Cys Met
 785 790 795
 acg ctg gtg gac aag gtg ggc cgg gcc aac gac ctc acc att gac tac
 2509
 Thr Leu Val Asp Lys Val Gly Arg Ala Asn Asp Leu Thr Ile Asp Tyr
 800 805 810
 gct gac cag cgc ctc tac tgg acc gac ctg gac acc aac atg atc gag
 2557
 Ala Asp Gln Arg Leu Tyr Trp Thr Asp Leu Asp Thr Asn Met Ile Glu
 815 820 825
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 2605
 Ser Ser Asn Met Leu Gly Gln Glu Arg Val Val Ile Ala Asp Asp Leu
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 ccg cac ccg ttc ggt ctg acg cag tac agc gat tat atc tac tgg aca
 2653
 Pro His Pro Phe Gly Leu Thr Gln Tyr Ser Asp Tyr Ile Tyr Trp Thr
 850 855 860
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 2701
 Asp Trp Asn Leu His Ser Ile Glu Arg Ala Asp Lys Thr Ser Gly Arg
 865 870 875
 aac cgc acc ctc atc cag ggc cac ctg gac ttc gtg atg gac atc ctg
 2749
 Asn Arg Thr Leu Ile Gln Gly His Leu Asp Phe Val Met Asp Ile Leu
 880 885 890
 gtg ttc cac tcc tcc cgc cag gat ggc ctc aat gac tgt atg cac aac

2797
 Val Phe His Ser Ser Arg Gln Asp Gly Leu Asn Asp Cys Met His Asn
 895 900 905
 aac ggg cag tgt ggg cag ctg tgc ctt gcc atc ccc ggc ggc cac cgc
 2845
 Asn Gly Gln Cys Gly Gln Leu Cys Leu Ala Ile Pro Gly Gly His Arg
 910 915 920 925
 tgc ggc tgc gcc tca cac tac acc ctg gac ccc agc agc cgc aac tgc
 2893
 Cys Gly Cys Ala Ser His Tyr Thr Leu Asp Pro Ser Ser Arg Asn Cys
 930 935 940
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 2941
 Ser Pro Pro Thr Thr Phe Leu Leu Phe Ser Gln Lys Ser Ala Ile Ser
 945 950 955
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 Arg Met Ile Pro Asp Asp Gln His Ser Pro Asp Leu Ile Leu Pro Leu
 960 965 970
 cat gga ctg agg aac gtc aaa gcc atc gac tat gac cca ctg gac aag
 3037
 His Gly Leu Arg Asn Val Lys Ala Ile Asp Tyr Asp Pro Leu Asp Lys
 975 980 985
 ttc atc tac tgg gtg gat ggg cgc cag aac atc aag cga gcc aag gac
 3085
 Phe Ile Tyr Trp Val Asp Gly Arg Gln Asn Ile Lys Arg Ala Lys Asp
 990 995 1000 1005
 gac ggg acc cag ccc ttt gtt ttg acc tct ctg agc caa ggc caa aac
 3133
 Asp Gly Thr Gln Pro Phe Val Leu Thr Ser Leu Ser Gln Gly Gln Asn
 1010 1015 1020
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 3181
 Pro Asp Arg Gln Pro His Asp Leu Ser Ile Asp Ile Tyr Ser Arg Thr
 1025 1030 1035
 ctg ttc tgg acg tgc gag gcc acc aat acc atc aac gtc cac agg ctg
 3229
 Leu Phe Trp Thr Cys Glu Ala Thr Asn Thr Ile Asn Val His Arg Leu
 1040 1045 1050
 agc ggg gaa gcc atg ggg gtg gtg ctg cgt ggg gac cgc gac aag ccc
 3277
 Ser Gly Glu Ala Met Gly Val Val Leu Arg Gly Asp Arg Asp Lys Pro
 1055 1060 1065
 agg gcc atc gtc gtc aac gcg gag cga ggg tac ctg tac ttc acc aac
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 Arg Ala Ile Val Val Asn Ala Glu Arg Gly Tyr Leu Tyr Phe Thr Asn
 1070 1075 1080 1085
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 3373
 Met Gln Asp Arg Ala Ala Lys Ile Glu Arg Ala Ala Leu Asp Gly Thr
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 Glu Arg Glu Val Leu Phe Thr Thr Gly Leu Ile Arg Pro Val Ala Leu
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 gtg gtg gac aac aca ctg ggc aag ctg ttc tgg gtg gac gcg gac ctg
 3469

Val Val Asp Asn Thr Leu Gly Lys Leu Phe Trp Val Asp Ala Asp Leu
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Lys Arg Ile Glu Ser Cys Asp Leu Ser Gly Ala Asn Arg Leu Thr Leu
1135 1140 1145
gag gac gcc aac atc gtg cag cct ctg ggc ctg acc atc ctt ggc aag
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Glu Asp Ala Asn Ile Val Gln Pro Leu Gly Leu Thr Ile Leu Gly Lys
1150 1155 1160 1165
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His Leu Tyr Trp Ile Asp Arg Gln Gln Gln Met Ile Glu Arg Val Glu
1170 1175 1180
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3661
Lys Thr Thr Gly Asp Lys Arg Thr Arg Ile Gln Gly Arg Val Ala His
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Leu Thr Gly Ile His Ala Val Glu Glu Val Ser Leu Glu Glu Phe Ser
1200 1205 1210
gcc cac cca tgt gcc cgt gac aat ggt ggc tgc tcc cac atc tgt att
3757
Ala His Pro Cys Ala Arg Asp Asn Gly Gly Cys Ser His Ile Cys Ile
1215 1220 1225
gcc aag ggt gat ggg aca cca cgg tgc tca tgc cca gtc cac ctc gtg
3805
Ala Lys Gly Asp Gly Thr Pro Arg Cys Ser Cys Pro Val His Leu Val
1230 1235 1240 1245
ctc ctg cag aac ctg ctg acc tgt gga gag ccg ccc acc tgc tcc ccg
3853
Leu Leu Gln Asn Leu Leu Thr Cys Gly Glu Pro Pro Thr Cys Ser Pro
1250 1255 1260
gac cag ttt gca tgt gcc aca ggg gag atc gac tgt atc ccc ggg gcc
3901
Asp Gln Phe Ala Cys Ala Thr Gly Glu Ile Asp Cys Ile Pro Gly Ala
1265 1270 1275
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3949
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3997
Gly Cys Pro Val Cys Ser Ala Ala Gln Phe Pro Cys Ala Arg Gly Gln
1295 1300 1305
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4045
Cys Val Asp Leu Arg Leu Arg Cys Asp Gly Glu Ala Asp Cys Gln Asp
1310 1315 1320 1325
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4093
Arg Ser Asp Glu Val Asp Cys Asp Ala Ile Cys Leu Pro Asn Gln Phe
1330 1335 1340
cgg tgt gcg agc ggc cag tgt gtc ctc atc aaa cag cag tgc gac tcc
4141
Arg Cys Ala Ser Gly Gln Cys Val Leu Ile Lys Gln Gln Cys Asp Ser

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          1345          1350          1355
    ttc ccc gac tgt atc gac ggc tcc gac gag ctc atg tgt gaa atc acc
4189
    Phe Pro Asp Cys Ile Asp Gly Ser Asp Glu Leu Met Cys Glu Ile Thr
          1360          1365          1370
    aag ccg ccc tca gac gac agc ccg gcc cac agc agt gcc atc ggg ccc
4237
    Lys Pro Pro Ser Asp Asp Ser Pro Ala His Ser Ser Ala Ile Gly Pro
          1375          1380          1385
    gtc att ggc atc atc ctc tct ctc ttc gtc atg ggt ggt gtc tat ttt
4285
    Val Ile Gly Ile Ile Leu Ser Leu Phe Val Met Gly Gly Val Tyr Phe
          1390          1395          1400          1405
    gtg tgc cag cgc gtg gtg tgc cag cgc tat gcg ggg gcc aac ggg ccc
4333
    Val Cys Gln Arg Val Val Cys Gln Arg Tyr Ala Gly Ala Asn Gly Pro
          1410          1415          1420
    ttc ccg cac gag tat gtc agc ggg acc ccg cac gtg ccc ctc aat ttc
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    Phe Pro His Glu Tyr Val Ser Gly Thr Pro His Val Pro Leu Asn Phe
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    ata gcc ccg ggc ggt tcc cag cat ggc ccc ttc aca ggc atc gca tgc
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    Ile Ala Pro Gly Gly Ser Gln His Gly Pro Phe Thr Gly Ile Ala Cys
          1440          1445          1450
    gga aag tcc atg atg agc tcc gtg agc ctg atg ggg ggc cgg ggc ggg
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    Gly Lys Ser Met Met Ser Ser Val Ser Leu Met Gly Gly Arg Gly Gly
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4525
    Val Pro Leu Tyr Asp Arg Asn His Val Thr Gly Ala Ser Ser Ser Ser
          1470          1475          1480          1485
    tcg tcc agc acg aag gcc acg ctg tac ccg ccg atc ctg aac ccg ccg
4573
    Ser Ser Ser Thr Lys Ala Thr Leu Tyr Pro Pro Ile Leu Asn Pro Pro
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4621
    Pro Ser Pro Ala Thr Asp Pro Ser Leu Tyr Asn Met Asp Met Phe Tyr
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    tct tca aac att ccg gcc act gcg aga ccg tac agg ccc tac atc att
4669
    Ser Ser Asn Ile Pro Ala Thr Ala Arg Pro Tyr Arg Pro Tyr Ile Ile
          1520          1525          1530
    cga gga atg gcg ccc ccg acg acg ccc tgc agc acc gac gtg tgt gac
4717
    Arg Gly Met Ala Pro Pro Thr Thr Pro Cys Ser Thr Asp Val Cys Asp
          1535          1540          1545
    agc gac tac agc gcc agc cgc tgg aag gcc agc aag tac tac ctg gat
4765
    Ser Asp Tyr Ser Ala Ser Arg Trp Lys Ala Ser Lys Tyr Tyr Leu Asp
          1550          1555          1560          1565
    ttg aac tcg gac tca gac ccc tat cca ccc cca ccc acg ccc cac agc
4813
    Leu Asn Ser Asp Ser Asp Pro Tyr Pro Pro Pro Pro Thr Pro His Ser
          1570          1575          1580

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cag tac ctg tcg gcg gag gac agc tgc ccg ccc tcg ccc gcc acc gag
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 Gln Tyr Leu Ser Ala Glu Asp Ser Cys Pro Pro Ser Pro Ala Thr Glu
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 Arg Ser Tyr Phe His Leu Phe Pro Pro Pro Pro Ser Pro Cys Thr Asp
 1600 1605 1610
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 Ser Ser
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 <212> PRT
 <213> Homo sapiens

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 35 40 45
 Gly Gly Val Lys Leu Glu Ser Thr Ile Val Val Ser Gly Leu Glu Asp
 50 55 60
 Ala Ala Ala Val Asp Phe Gln Phe Ser Lys Gly Ala Val Tyr Trp Thr
 65 70 75 80
 Asp Val Ser Glu Glu Ala Ile Lys Gln Thr Tyr Leu Asn Gln Thr Gly
 85 90 95
 Ala Ala Val Gln Asn Val Val Ile Ser Gly Leu Val Ser Pro Asp Gly
 100 105 110
 Leu Ala Cys Asp Trp Val Gly Lys Lys Leu Tyr Trp Thr Asp Ser Glu
 115 120 125
 Thr Asn Arg Ile Glu Val Ala Asn Leu Asn Gly Thr Ser Arg Lys Val
 130 135 140
 Leu Phe Trp Gln Asp Leu Asp Gln Pro Lys Ala Ile Ala Leu Asp Pro
 145 150 155 160
 Ala His Gly Tyr Met Tyr Trp Thr Asp Trp Gly Glu Thr Pro Arg Ile
 165 170 175
 Glu Arg Ala Gly Met Asp Gly Ser Thr Arg Lys Ile Ile Val Asp Ser
 180 185 190
 Asp Ile Tyr Trp Pro Asn Gly Leu Thr Ile Asp Leu Glu Glu Gln Lys
 195 200 205
 Leu Tyr Trp Ala Asp Ala Lys Leu Ser Phe Ile His Arg Ala Asn Leu
 210 215 220
 Asp Gly Ser Phe Arg Gln Lys Val Val Glu Gly Ser Leu Thr His Pro
 225 230 235 240
 Phe Ala Leu Thr Leu Ser Gly Asp Thr Leu Tyr Trp Thr Asp Trp Gln
 245 250 255

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Arg | Ser | Ile | His | Ala | Cys | Asn | Lys | Arg | Thr | Gly | Gly | Lys | Arg | Lys |
| | | | 260 | | | | | 265 | | | | | 270 | | |
| Glu | Ile | Leu | Ser | Ala | Leu | Tyr | Ser | Pro | Met | Asp | Ile | Gln | Val | Leu | Ser |
| | | 275 | | | | | 280 | | | | | 285 | | | |
| Gln | Glu | Arg | Gln | Pro | Phe | Phe | His | Thr | Arg | Cys | Glu | Glu | Asp | Asn | Gly |
| | 290 | | | | | 295 | | | | | 300 | | | | |
| Gly | Trp | Ser | His | Leu | Cys | Leu | Leu | Ser | Pro | Ser | Glu | Pro | Phe | Tyr | Thr |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 |
| Cys | Ala | Cys | Pro | Thr | Gly | Val | Gln | Met | Gln | Asp | Asn | Gly | Arg | Thr | Cys |
| | | | | 325 | | | | | 330 | | | | | 335 | |
| Lys | Ala | Gly | Ala | Glu | Glu | Val | Leu | Leu | Leu | Ala | Arg | Arg | Thr | Asp | Leu |
| | | | 340 | | | | | 345 | | | | | 350 | | |
| Arg | Arg | Ile | Ser | Leu | Asp | Thr | Pro | Asp | Phe | Thr | Asp | Ile | Val | Leu | Gln |
| | | 355 | | | | | 360 | | | | | 365 | | | |
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| Thr | Asp | Thr | Gly | Thr | Asp | Arg | Ile | Glu | Val | Thr | Arg | Leu | Asn | Gly | Thr |
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| Ser | Arg | Lys | Ile | Leu | Val | Ser | Glu | Asp | Leu | Asp | Glu | Pro | Arg | Ala | Ile |
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| Arg | Leu | Tyr | Trp | Thr | Asp | Leu | Asp | Thr | Asn | Met | Ile | Glu | Ser | Ser | Asn |
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| | 835 | | | | | | 840 | | | | | 845 | | | |
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| Thr | Thr | Phe | Leu | Leu | Phe | Ser | Gln | Lys | Ser | Ala | Ile | Ser | Arg | Met | Ile |
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| | | | | | | | | | | | | | | | | | |
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| Ala | Cys | Ala | Thr | Gly | Glu | Ile | Asp | Cys | Ile | Pro | Gly | Ala | Trp | Arg | Cys | | |
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| Ile | Ile | Leu | Ser | Leu | Phe | Val | Met | Gly | Gly | Val | Tyr | Phe | Val | Cys | Gln | | |
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| Arg | Val | Val | Cys | Gln | Arg | Tyr | Ala | Gly | Ala | Asn | Gly | Pro | Phe | Pro | His | | |
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| Ala | Pro | Pro | Thr | Thr | Pro | Cys | Ser | Thr | Asp | Val | Cys | Asp | Ser | Asp | Tyr | | |
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 35 40 45
 Gly Gly Val Lys Leu Glu Ser Thr Ile Val Val Ser Gly Leu Glu Asp
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 Leu Phe Trp Gln Asp Leu Asp Gln Pro Lys Ala Ile Ala Leu Asp Pro
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 Glu Arg Ala Gly Met Asp Gly Ser Thr Arg Lys Ile Ile Val Asp Ser
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 Leu Tyr Trp Ala Asp Ala Lys Leu Ser Phe Ile His Arg Ala Asn Leu
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 Asp Gly Ser Phe Arg Gln Lys Val Val Glu Gly Ser Leu Thr His Pro
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 Gly Trp Ser His Leu Cys Leu Leu Ser Pro Ser Glu Pro Phe Tyr Thr
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| | | | | | | | | | | | | | | | |
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| Tyr | Leu | Asp | Gly | Ser | Gly | Ala | Gln | Thr | Leu | Val | Asn | Thr | Glu | Ile | Asn |
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| | | | | |
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| Trp Val Asp Gly Arg Gln Asn Ile Lys Arg Ala Lys Asp Asp Gly Thr | | | | |
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| Asp Gly Thr Pro Arg Cys Ser Cys Pro Val His Leu Val Leu Gln | | | | |
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 <220>
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 <400> 12
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 <210> 13
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 <220>
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 <400> 13
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 <210> 14
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 <220>
 <223> Artificial sequence is a primer.

 <400> 14
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 <210> 15
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 <220>
 <223> Artificial sequence is a primer.

 <400> 15
 ttgaggatcc agaattctcg ag 22

 <210> 16
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 <210> 23
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 <220>
 <223> Artificial sequence is a primer.

 <400> 23
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 <400> 24
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 <210> 25
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 <400> 26
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 <210> 27
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 <220>

<223> Artificial sequence is a primer.

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<210> 28
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<220>
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<400> 28
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<210> 29
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<400> 29
ctcgtgccg 9

<210> 30
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<220>
<223> Artificial sequence is a primer.

<400> 30
gtacgacggc cagt 14

<210> 31
<211> 16
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<220>
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<400> 31
aacagctatg accatg 16

<210> 32
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| <220> | |
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| <400> 33 | |
| aatacctgaa accatacctg | 20 |
| <210> 34 | |
| <211> 57 | |
| <212> DNA | |
| <213> Artificial Sequence | |
| <220> | |
| <223> Artificial sequence is a primer. | |
| <400> 34 | |
| agctgctcgt agctgtctct ccctggatca cgggtacatg tactggacag actgggt | 57 |
| <210> 35 | |
| <211> 56 | |
| <212> DNA | |
| <213> Artificial Sequence | |
| <220> | |
| <223> Artificial sequence is a primer. | |
| <400> 35 | |
| tgagacgccc ggattgagcg ggcagggata gcttattccc tgtgccgcat tacggc | 56 |
| <210> 36 | |
| <211> 27 | |
| <212> DNA | |
| <213> Artificial Sequence | |
| <220> | |
| <223> Artificial sequence is a primer. | |
| <400> 36 | |
| agctgctcgt agctgtctct ccctgga | 27 |
| <210> 37 | |
| <211> 27 | |
| <212> DNA | |
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| <220> | |
| <223> Artificial sequence is a primer. | |
| <400> 37 | |
| gccgtaatgc ggcacagga ataagct | 27 |

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 <210> 39
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 <220>
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 <400> 39
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 <210> 40
 <211> 163
 <212> DNA
 <213> Homo sapiens

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 <210> 41
 <211> 419
 <212> DNA
 <213> Homo sapiens

 <400> 41
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 <210> 42
 <211> 221
 <212> DNA
 <213> Homo sapiens

 <400> 42
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 ctgaccatcg acctggagga gcagaagctc tactgggctg acgccaagct cagcttcatc 180
 caccgtgccca acctggacgg ctcgttccgg taggtaccca c 221

<210> 43
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 <212> DNA
 <213> Homo sapiens

<400> 43
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 agcgcaactgg ggggaagagg aaggagatcc tgagtgccct atactcacc atggacatcc 180
 aggtgctgag ccaggagcgg cagccttttt gtgagtgccg g 221

<210> 44
 <211> 156
 <212> DNA
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<400> 44
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 cggcaggacg tgtaaggcag gtgaggcggg gggacg 156

<210> 45
 <211> 416
 <212> DNA
 <213> Homo sapiens

<400> 45
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 gctggacacg ccggacttca ccgacatcgt gctgcagggtg gacgacatcc ggcacgccat 120
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<210> 46
 <211> 198
 <212> DNA
 <213> Homo sapiens

<400> 46
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 aacttgatg ggcaggagcg gcgtgtgctg gtcaatgcct ccctcgggtg gccaacggc 120
 ctggccctgg acctgcagga ggggaagctc tactggggag acgccaagac agacaagatc 180
 gaggtgaggc tcctgtgg 198

<210> 47
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 <212> DNA
 <213> Homo sapiens

<400> 47
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 gccgcagcat cgagcgggtg cacaaggta aggccagccg ggacgtcatc attgaccagc 180
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ggtc

244

<210> 48

<211> 313

<212> DNA

<213> Homo sapiens

<400> 48

| | | | | | | |
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| tctgcacacc | ccacgcaacc | cgggtgtggc | gccccatcgg | cctggagctg | ctgagtgaca | 120 |
| tgaagacctg | catcgtgcct | gaggcctttt | tggctttcac | cagcagagcc | gccatccaca | 180 |
| ggatctccct | cgagaccaat | aacaacgacg | tggccatccc | gctcacgggc | gtcaaggagg | 240 |
| cctcagccct | ggactttgat | gtgtccaaca | accacatcta | ctggacagac | gtcagcctga | 300 |
| aggtacgctg | ggc | | | | | 313 |

<210> 49

<211> 255

<212> DNA

<213> Homo sapiens

<400> 49

| | | | | | | |
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| cctgctgcca | gaccatcagc | cgcgccttca | tgaacgggag | ctcgggtggag | cacgtggtgg | 60 |
| agtttggcct | tgactacccc | gagggcatgg | ccgttgactg | gatgggcaag | aacctctact | 120 |
| gggcccagac | tgaggaccaac | agaatcgaag | tggcgcggct | ggacgggcag | ttccggcaag | 180 |
| tcctcgtgtg | gagggacttg | gacaacccga | ggtcgctggc | cctggatccc | accaaggggt | 240 |
| aagtgtttgc | ctgtc | | | | | 255 |

<210> 50

<211> 210

<212> DNA

<213> Homo sapiens

<400> 50

| | | | | | | |
|------------|------------|------------|------------|------------|------------|-----|
| gtgccttcca | gctacatcta | ctggaccgag | tggggcggca | agccgaggat | cgtgcggggc | 60 |
| ttcatggacg | ggaccaactg | catgacgctg | gtggacaagg | tgggccgggc | caacgacctc | 120 |
| accattgact | acgctgacca | gcgcctctac | tggaccgacc | tggacaccaa | catgatcgag | 180 |
| tcgtccaaca | tgctgggtga | gggccgggct | | | | 210 |

<210> 51

<211> 352

<212> DNA

<213> Homo sapiens

<400> 51

| | | | | | | |
|------------|------------|------------|------------|------------|------------|-----|
| gtgttcatgc | aggtcaggag | cgggtcgtga | ttgccgacga | tctcccgcac | ccgttcggtc | 60 |
| tgacgcagta | cagcgattat | atctactgga | cagactggaa | tctgcacagc | attgagcggg | 120 |
| ccgacaagac | tagcggccgg | aaccgcaccc | tcattccagg | ccacctggac | ttcgtgatgg | 180 |
| acatcctgg | gttccactcc | tcccgccagg | atggcctcaa | tgactgtatg | cacaacaacg | 240 |
| ggcagtgtgg | gcagctgtgc | cttgccatcc | ccggcggcca | ccgctgcggc | tgcgcctcac | 300 |
| actacaccct | ggaccccagc | agccgcaact | gcagccgtaa | gtgcctcatg | gt | 352 |

<210> 52

<211> 225

<212> DNA

<213> Homo sapiens

<400> 52

| | | | | | | |
|------------|------------|------------|------------|-------------|------------|-----|
| gcctcctcta | cgcccaccac | cttcttgctg | ttcagccaga | aatctgccat | cagtcggatg | 60 |
| atcccggacg | accagcacag | cccggatctc | atcctgcccc | tgcattggact | gaggaacgtc | 120 |
| aaagccatcg | actatgaccc | actggacaag | ttcatctact | gggtggatgg | gcgccagaac | 180 |
| atcaagcgag | ccaaggacga | cgggacccag | gcaggtgccc | tgtgg | | 225 |

<210> 53
 <211> 235
 <212> DNA
 <213> Homo sapiens

| | | | | | | |
|------------|------------|------------|------------|------------|------------|-----|
| <400> 53 | | | | | | |
| ctttgtctta | cagccctttg | ttttgacctc | tctgagccaa | ggccaaaacc | cagacaggca | 60 |
| gccccacgac | ctcagcatcg | acatctacag | cggacactg | ttctggacgt | gcgaggccac | 120 |
| caataccatc | aacgtccaca | ggctgagcgg | ggaagccatg | gggtgggtgc | tgcgtgggga | 180 |
| ccgcgacaag | cccagggcca | tcgtcgtcaa | cgcggagcga | gggtaggagg | ccaac | 235 |

<210> 54
 <211> 218
 <212> DNA
 <213> Homo sapiens

| | | | | | | |
|------------|------------|------------|------------|------------|------------|-----|
| <400> 54 | | | | | | |
| ccaccctccc | gcaggtacct | gtacttcacc | aacatgcagg | accgggcagc | caagatcgaa | 60 |
| cgcgcagccc | tggacggcac | cgagcgcgag | gtcctcttca | ccaccggcct | catccgccct | 120 |
| gtggcccttg | tgggtggaaa | cacactgggc | aagctgttct | gggtggacgc | ggacctgaag | 180 |
| cgcattgaga | gctgtgacct | gtcaggtacg | cgccccgg | | | 218 |

<210> 55
 <211> 234
 <212> DNA
 <213> Homo sapiens

| | | | | | | |
|------------|-------------|------------|------------|------------|------------|-----|
| <400> 55 | | | | | | |
| ggctgcttgc | agggggccaac | cgcttgaccc | tggaggacgc | caacatcgtg | cagcctctgg | 60 |
| gcctgaccat | ccttggcaag | catctctact | ggatcgaccg | ccagcagcag | atgatcgagc | 120 |
| gtgtggagaa | gaccaccggg | gacaagcgga | ctcgcatcca | gggccgtgtc | gcccacctca | 180 |
| ctggcatcca | tgcagtggag | gaagtcagcc | tggaggagtt | ctgtacgtgg | gggc | 234 |

<210> 56
 <211> 157
 <212> DNA
 <213> Homo sapiens

| | | | | | | |
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| <400> 56 | | | | | | |
| ttgtctttgc | agcagcccac | ccatgtgccc | gtgacaatgg | tggctgctcc | cacatctgta | 60 |
| ttgccaaagg | tgatgggaca | ccacgggtgt | catgcccagt | ccacctcgtg | ctcctgcaga | 120 |
| acctgctgac | ctgtggaggt | aggtgtgacc | taggtgc | | | 157 |

<210> 57
 <211> 272
 <212> DNA
 <213> Homo sapiens

| | | | | | | |
|------------|------------|------------|------------|------------|------------|-----|
| <400> 57 | | | | | | |
| gttctctctt | gtccctcccc | cagagccgcc | cacctgctcc | ccggaccagt | ttgcatgtgc | 60 |
| cacaggggag | atcgactgta | tccccggggc | ctggcgctgt | gacggctttc | ccgagtgcga | 120 |
| tgaccagagc | gacgaggagg | gctgccccgt | gtgctccgcc | gcccagttcc | cctgcgcgcg | 180 |

| | | | | | | |
|------------|------------|------------|------------|------------|------------|-----|
| gggtcagtgt | gtggacctgc | gcctgcgctg | cgacggcgag | gcagactgtc | aggaccgctc | 240 |
| agacgaggtg | gactgtgacg | gtgaggccct | cc | | | 272 |

<210> 58
 <211> 134
 <212> DNA
 <213> Homo sapiens

| | | | | | | |
|------------|------------|------------|------------|------------|------------|-----|
| <400> 58 | | | | | | |
| tctccttgca | gccatctgcc | tgcccaacca | gttccggtgt | gcgagcggcc | agtgtgtcct | 60 |
| catcaaacag | cagtgcgact | ccttccccga | ctgtatcgac | ggctccgacg | agctcatgtg | 120 |
| tggtgagcca | gctt | | | | | 134 |

<210> 59
 <211> 274
 <212> DNA
 <213> Homo sapiens

| | | | | | | |
|------------|------------|------------|-------------|------------|------------|-----|
| <400> 59 | | | | | | |
| gtttgtctct | ggcagaaatc | accaagccgc | cctcagacga | cagcccggcc | cacagcagtg | 60 |
| ccatcggggc | cgtcattggc | atcatcctct | ctctcttcgt | catgggtggg | gtctatcttg | 120 |
| tgtgccagcg | cgtgggtgtg | cagcgctatg | cggggggccaa | cgggcccttc | ccgcacgagt | 180 |
| atgtcagcgg | gaccccgcac | gtgcccctca | atttcatagc | cccgggcggg | tcccagcatg | 240 |
| gccccttcac | aggtaaggag | cctgagatat | ggaa | | | 274 |

<210> 60
 <211> 164
 <212> DNA
 <213> Homo sapiens

| | | | | | | |
|------------|------------|------------|-------------|------------|------------|-----|
| <400> 60 | | | | | | |
| cttccctgcc | aggcatcgca | tgcggaagt | ccatgatgag | ctccgtgagc | ctgatggggg | 60 |
| gccggggcgg | ggtgcccctc | tacgaccgga | accacgtcac | aggggcctcg | tccagcagct | 120 |
| cgtccagcac | gaaggccacg | ctgtaccgcg | cgggtgagggg | cggg | | 164 |

<210> 61
 <211> 130
 <212> DNA
 <213> Homo sapiens

| | | | | | | |
|------------|------------|------------|------------|------------|------------|-----|
| <400> 61 | | | | | | |
| ttggctctcc | tcagatcctg | aaccgcgcgc | cctccccggc | cacggacccc | tccctgtaca | 60 |
| acatggacat | gttctactct | tcaaacattc | cggccactgc | gagaccgtac | aggtaggaca | 120 |
| tcccctgcag | | | | | | 130 |

<210> 62
 <211> 496
 <212> DNA
 <213> Homo sapiens

| | | | | | | |
|------------|------------|------------|------------|------------|------------|-----|
| <400> 62 | | | | | | |
| tcaaacattc | cggccactgc | gagaccgtac | aggccctaca | tcattcgagg | aatggcgccc | 60 |
| ccgacgacgc | cctgcagcac | cgacgtgtgt | gacagcgact | acagcgccag | ccgctggaag | 120 |
| gccagcaagt | actacctgga | tttgaactcg | gactcagacc | cctatccacc | cccaccacg | 180 |
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